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TITLE: ELECTROPHORESIS DEVICE

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INVENTOR-INFORMATION:
NAME
ANDO, TAKASHI

ASSIGNEE-INFORMATION:
NAME
COUNTRY
SANYO ELECTRIC CO LTD N/A

APPL-NO: JP06051941

APPL-DATE: March 23, 1994

INT-CL (IPC): G01N027/447;G01N021/17 ;G01N021/64

ABSTRACT:

PURPOSE: To easily extract the molecules at desired position in distribution
with the instruction by a computer by inputting an electrophoresis pattern in
the computer of an electrophoresis device without transferring to a photograph
plate and the like.

CONSTITUTION: The title device has a movable table provided with an ultraviolet
light source, a photoelectric multiplier 12 and a

sampler for gel cutout 11,
which obtains the electrophoresis pattern of the molecules tagged with
fluorescence during or after electrophoresis in electrophoresis tanks 19, 20 by
scanning with the ultraviolet light.
Simultaneously, such data as
electrophoresis pattern obtained by more finely dividing the particular sample
obtained by the sampler 11 for cutting out
molecules which is locally placed,
are displayed on a screen of a display coupled with a computer 1.

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Ｇ０１Ｎ　27/447				
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21/64		Z		
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(22)出願日　平成６年(1994)３月23日

(71)出願人　000001889
三洋電機株式会社
大阪府守口市京阪本通２丁目５番５号

(72)発明者　安藤　崇
大阪府守口市京阪本通２丁目５番５号　三洋電機株式会社内

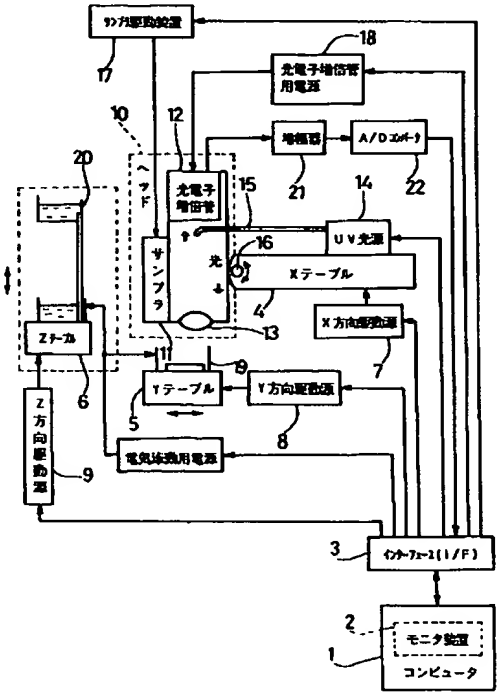
(74)代理人　弁理士　安富　耕二

(54)【発明の名称】　電気泳動装置

(57)【要約】

【目的】　電気泳動装置において、電気泳動パターンを、写真乾板等に転写することなく、コンピュータに入力し、コンピュータの指示によって所望の位置に分布する分子の抽出を容易に行えることを目的とする。

【構成】　本発明は、紫外線光源、光電子増倍管及びゲル切出し用サンプラを備えた可動テーブルを有し、蛍光標識を施した分子を、電気泳動槽内で電気泳動中又は電気泳動後に、前記紫外線光源による走査に従って前記泳動パターンを得ると共に極在する分子切出し用のサンプラによって得た特定のサンプルを更に細分化して得られる電気泳動パターン等のデータをコンピュータに結合した表示装置の画面上に表示するものである。



1

【特許請求の範囲】

【請求項1】　紫外線光源、光電子増倍管及びゲル切出し用サンプラを備えた可動テーブルを有し、蛍光標識を施した分子を、電気泳動槽内で電気泳動中又は電気泳動後に、前記紫外線光源による走査に従って前記電子増倍管で検知してコンピュータ内に電気泳動パターンを得て、コンピュータに結合した表示装置の画面上に表示すると共に極在する分子をサンプラによって抽出可能としたことを特徴とする電気泳動装置。

【請求項2】　紫外線光源、光電子増幅管及びゲル切出し用サンプラを備えた第1の可動テーブルと、該第1の可動テーブルとは異なった方向に電気泳動槽を移動させる第2の可動テーブルと、蛍光標識を施した分子を、前記各電気泳動槽内で電気泳動中又は電気泳動後に、前記紫外線光源による走査に従って前記電子増倍管で検知して、前記各電気泳動槽における電気泳動パターンをコンピュータ内に得て、コンピュータに結合した表示装置の画面上に表示すると共に極在する分子をサンプラにより抽出可能としたことを特徴とする電気泳動装置。

【請求項3】　紫外線光源、光電子増倍管及びゲル切出し用サンプラを備えた第1の可動テーブルと、該第1の可動テーブルと移動方向が90°異なった方向に電気泳動槽を移動させる第2の可動テーブルと、前記第1及び第2の可動テーブルに移動方向が90°異なった方向に電気泳動槽を移動させる第3の可動テーブルと、蛍光標識を施した分子を、前記各電気泳動槽内で電気泳動中又は電気泳動後に、前記紫外線光源による走査に従って前記電子増倍管で検知して電気泳動パターンを得て、コンピュータに結合した表示装置の画面上に表示すると共に極在する分子をサンプラによって抽出可能としたことを特徴とする電気泳動装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、蛋白質又はDNA（Desoxyribonucleic Acid　デソキシリボ核酸の略称）断片等の分画に用いる電気泳動装置に係わり、特に紫外線光源、電子増倍管、光学系及びサンプリング用のサンプラを用いたヘッドによって電気泳動ゲル上で走査して検知し、その検出データをコンピュータに入力して、それに基づいて所望のゲル部分を、前記サンプラによって切出し可能とすると共にコンピュータに結合した表示装置にパターン表示する同装置に関する。

【0002】

【従来の技術】一般に蛋白質又はDNA断片の分画に対して、電気泳動を用いて分画する場合、特定の部分を取出してそれを種々の処理（PCR：ポリメラーゼ・チェーン・リアクション等）を行い、更に電気泳動を施すとき、先ず前記特定部分の切出しに人手がかかり、その手間も容易ではない。更に前記電気泳動パターンを写真乾板などに転写して専門家が読み取ると共に分析を行って

2

いた。

【0003】そこで貯水槽付の電気泳動装置は、1983年11月20日株式会社講談社発行「分子生物学実験マニュアル」P．99～102に示してあり、更にこの場合ゲルを用いた一例としてアガロースゲルの例が1983年9月10日株式会社培風館発行の「遺伝子操作の原理」P．6～9に示されている。

【0004】

【発明が解決しようとする課題】前述の従来技術では、電気泳動により分画された特定の部分を取出すときの切出しの手間が人手を要し、容易ではなかった。更に従来は、前記電気泳動パターンを写真乾板などに転写するだけで、各々の位置に分布する分子の抽出が、困難で、特にDNAの塩基配列の決定は容易ではなかった。

【0005】そこで本発明は、前記欠点を除去した新規な電気泳動装置を提案するものである。

【0006】

【課題を解決するための手段】本発明は、紫外線光源、光電子増倍管及びゲル切出し用サンプラを備えた可動テーブルを有し、蛍光標識を施した分子を、電気泳動槽内で電気泳動中又は電気泳動後に、前記紫外線光源による走査に従って前記電気泳動パターンをコンピュータに入力すると共にコンピュータに結合した表示装置の画面上に表示し、更にコンピュータで制御されるサンプラにより電気泳動パターンの特定部を切出し可能とした構成である。

【0007】

【作用】本発明の電気泳動装置によると、従来のゲル切出しによる手間が削減できると共に、サンプラで切出した分子から得て、更に細分化した分子の電気泳動パターンを抽出データとして得た後にもコンピュータで電子処理が可能となり、それに基づき、コンピュータに結合したモニタに表示し得るので、データ蓄積が容易になり、更にDNAの塩基配列等の決定が迅速に行うことができる。

【0008】

【実施例】図面に従って本発明を説明すると、図1は本発明の電気泳動装置の構成を示すブロック図、図2は電気泳動パターン及び特定分子抽出ブロックを示す状態図、図3は分子抽出用の抽出カプセルを示す斜視図である。図1において、1は各種のデータ処理及び駆動信号を発生するコンピュータで、表示装置としてのモニタ2が結合されている。

【0009】3はインターフェース（I／F）、4，5，6は各々X方向、Y方向及びZ方向に、X方向駆動源7、Y方向駆動源8及びZ方向駆動源9によって移動が行われるXテーブル、Yテーブル及びZテーブルを示す。10はサンプラ11、光電子増倍管12、レンズ13成るヘッドで、前記レンズ13に対してUV光源（紫外線光源）14から光伝導手段としての光ファイバ15

を介してUV線が供給される。前記ヘッド10は回転軸16で、Xテーブル4によって所定の位置に設定されるように回転する。

【0010】17はサンプラ駆動装置、18は光電子増倍管用電源、19はアガロースゲル電気泳動槽、20はアクリルアミドゲル電気泳動槽を示し、光ファイバ15を介して供給されたUV線がレンズ13を通して各電気泳動槽19又は20に照射し、光電子増倍管12によって電気泳動パターンを抽出して、増幅器21によって信号増幅を行い、その出力は、A／Dコンバータ22でアナログ・ディジタル（A／D）変換して、出力として得たディジタル信号はインターフェース（I／F）3を介してコンピュータ1に加わり、データ処理後モニタ2の画面上に表示される。

【0011】次に同装置の詳細な動作を説明すると、先ずYテーブル5上に載置された電気泳動用電源が供給されると、各分子は電気泳動速度に従って、やがて図2のように分画される。

【0012】各分子は予め蛍光標識してあるので、ゲルを紫外線（UV）スポットを照射して走査すると、分子の存在は可視の領域の強弱として検出される。図1におけるヘッド10には、光ファイバ15からの点光源としての紫外線と、それをゲルに照射するレンズ13を含む光学系として光電子増倍管12が内蔵されており、ゲル中のスポットの蛍光を検出する。

【0013】該ヘッド10は、Xテーブル4に設置されており、該Xテーブル4をX方向駆動源7で駆動することにより、X軸方向の走査がなされ、蛍光の強弱像が得られる。

【0014】Yテーブル5はY方向駆動源8によって適正な位置に設定して、通過パターンを抽出したり、自動泳動停止も可能である。更にヘッド10には、サンプラ駆動装置17によって上下するサンプラの機構が付加されており、例えば図3のような抽出カプセルを所望の位置に挿入して電気泳動を行うことにより、所望の分子を抽出することができる。

【0015】なお、アクリルアミドゲルを用いる縦型の電気泳動への対応として、ヘッド10は図1における回転軸16を中心に回転する構成で、必要に応じて図1の通りZ方向への移動を行うためZテーブル6を設けておけば、X，Y及びZの各方向に移動可能となって電気泳動パターンの抽出が容易となる。

【0016】各テーブル（X，Y及びZ）とサンプラ駆動装置17、UV光源14、各駆動源7，8，9は、インターフェース（I／F）3を通して、制御装置として設けたコンピュータ1によって制御される。

【0017】また前述のように光電子増倍管12で得られた信号は増幅管21（例えば演算増幅器）等で、増幅され、A／Dコンバータ22で、アナログ／ディジタル変換後にインターフェース（I／F）3を通してコンピュータ1に入力され、パターン化、成分化、分子量の推定等にデータ処理されて、表示用のモニタ2の画面上に表示される。

【0018】

【発明の効果】本発明の電気泳動装置によれば、蛋白質又はDNA断片の分画における電気泳動パターンを従来のように写真乾板などに転写することなく、紫外線光源、電子増倍管、光学系及びサンプラを備えたヘッドを電気泳動ゲル上で走査して、パターン抽出し、そのデータに基づいて、所望のゲル部分の切出しができ、電気泳動装置として、特にDNAの塩基配列の決定が迅速に行える等の利点が得られ、その効果は極めて大である。

【図面の簡単な説明】

【図1】図1は、本発明の電気泳動装置を示すブロック図である。

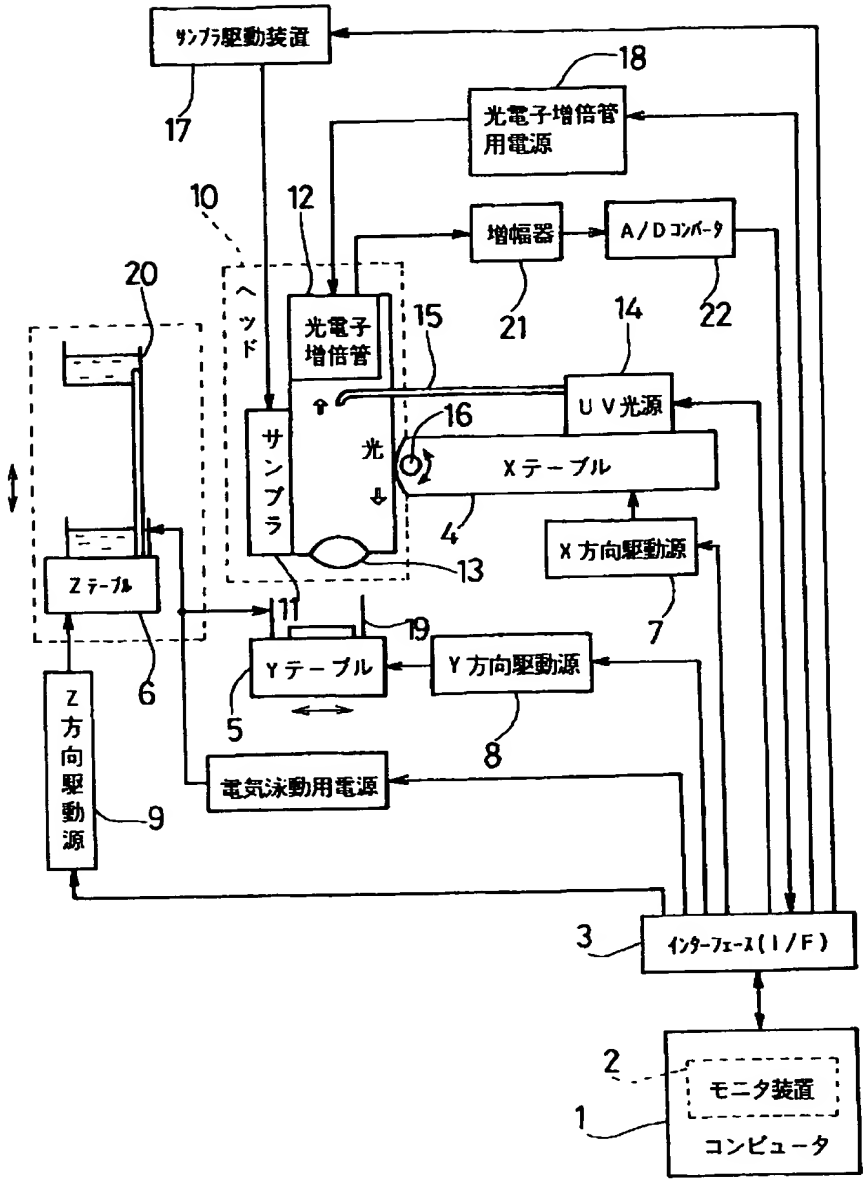
【図2】図2は同装置における電気泳動パターン及び特定分子抽出ブロックの状態図である。

【図3】図3は同装置における分子抽出用の抽出カプセルの斜視図である。

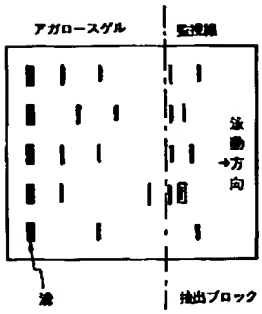
【符号の説明】

1	コンピュータ
2	モニタ
3	インターフェース
4	Xテーブル
5	Yテーブル
6	Zテーブル
10	ヘッド
11	サンプラ
12	光電子増倍管
13	レンズ
19，20	電気泳動槽
22	A／Dコンバータ

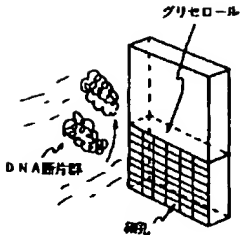
【図1】


サンプラ駆動装置
17
18
光電子増倍管用電源
10
12
増幅器
A/Dコンバータ
20
ヘッド
光電子増倍管
15
21
22
14
UV光源
16
光
Xテーブル
サンプラ
4
X方向駆動源
13
Zテーブル
11
19
7
Yテーブル
Y方向駆動源
6
5
8
Z方向駆動源
電気泳動用電源
9
3
インターフェース(I/F)
2
モニタ装置
1
コンピュータ

【図2】


アガロースゲル
泳動方向
抽出ブロック

【図3】


グリセロール
DNA断片群

PATENT ABSTRACTS OF JAPAN

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(43)Date of publication of application : **13.10.1995**

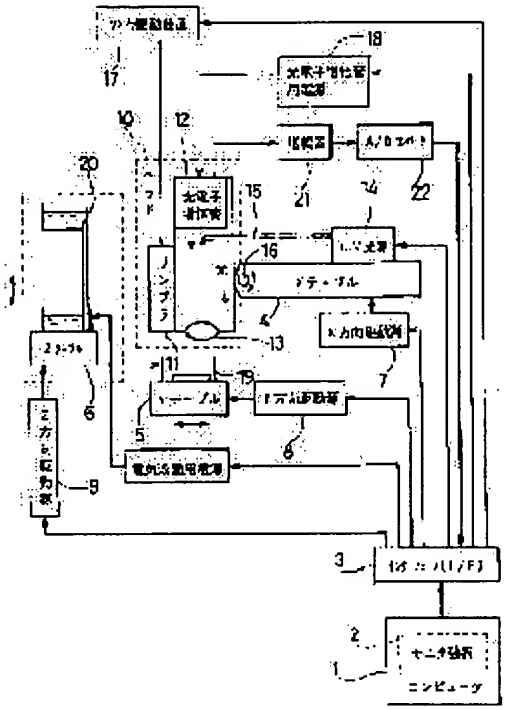
(51)Int.CI. **G01N 27/447**
G01N 21/17
G01N 21/64

(21)Application number : **06-051941**
(22)Date of filing : **23.03.1994**

(71)Applicant : **SANYO ELECTRIC CO LTD**
(72)Inventor : **ANDO TAKASHI**

(54) ELECTROPHORESIS DEVICE

(57)Abstract:
PURPOSE: To easily extract the molecules at desired position in distribution with the instruction by a computer by inputting an electrophoresis pattern in the computer of an electrophoresis device without transferring to a photograph plate and the like.
CONSTITUTION: The title device has a movable table provided with an ultraviolet light source, a photoelectric multiplier 12 and a sampler for gel cutout 11, which obtains the electrophoresis pattern of the molecules tagged with fluorescence during or after electrophoresis in electrophoresis tanks 19, 20 by scanning with the ultraviolet light. Simultaneously, such data as electrophoresis pattern obtained by more finely dividing the particular sample obtained by the sampler 11 for cutting out molecules which is locally placed, are displayed on a screen of a display coupled with a computer 1.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The electrophoresis apparatus characterized by to have had the movable table equipped with the ultraviolet line light source, the photomultiplier tube, and the sampler for gel logging, to have detected the molecule which gave the fluorescence indicator by the aforementioned electron multiplier during electrophoresis or after electrophoresis according to the scan by the aforementioned ultraviolet line light source within the electrophoresis tub, to have obtained the electrophoresis pattern in the computer, and to enable with a sampler extraction of the molecule which **** while displaying on the screen of the display combined with the computer.
[Claim 2] The 1st movable table equipped with the ultraviolet line light source and photoelectron amplifier tube and the sampler for gel logging, this -- with the 2nd movable table which moves an electrophoresis tub in the different direction from the 1st movable table The molecule which gave the fluorescence indicator is detected by the aforementioned electron multiplier during electrophoresis or after electrophoresis according to the scan by the aforementioned ultraviolet line light source within each aforementioned electrophoresis tub. The electrophoresis apparatus characterized by having obtained the electrophoresis pattern in each aforementioned electrophoresis tub in the computer, and enabling with a sampler extraction of the molecule which **** while displaying on the screen of the display combined with the computer.
[Claim 3] The 1st movable table equipped with the ultraviolet line light source, the photomultiplier tube, and the sampler for gel logging, this -- the movable table and the move direction of the 1st with the 2nd movable table which moves an electrophoresis tub in the direction different 90 degrees The 3rd movable table which makes the above 1st and the 2nd movable table move an electrophoresis tub in the direction in which the 90 degrees of the move directions differed, The molecule which gave the fluorescence indicator within each aforementioned electrophoresis tub during electrophoresis or after electrophoresis The electrophoresis apparatus characterized by having detected by the aforementioned electron multiplier according to the scan by the aforementioned ultraviolet line light source, having obtained the electrophoresis pattern, and enabling with a sampler extraction of the molecule which **** while displaying on the screen of the display combined with the computer.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] With respect to the electrophoresis apparatus used for fractionation, such as protein or a DNA (abbreviated name of Desoxyribonucleic Acid deoxyribonucleic acid) fragment, especially, this invention is scanned and detected on electrophoresis gel by the head using the ultraviolet line light source, an electron multiplier, optical system, and the sampler for a sampling, inputs the detection data into a computer, and it relates to this equipment which carries out a pattern display to the display combined with the computer while it makes logging of a desired gel portion possible with the aforementioned sampler based on it.
[0002]
[Description of the Prior Art] When carrying out fractionation to the fractionation of protein or a DNA fragment using electrophoresis generally, taking out a specific portion, performing various processings (PCR:polymerase chain reaction etc.) for it and performing electrophoresis further, a help starts logging of the aforementioned particular part first, and the time and effort is not easy, either. Furthermore, while the aforementioned electrophoresis pattern was imprinted to the photographic plate etc. and the expert read, it was analyzing.
[0003] Then, the electrophoresis apparatus with a water tank is shown in 1983 year 11 month 20 day Kodansha Issue "molecular biology experiment Manual" P.99-102, and the example of agarose gel is further shown in "principle of gene manipulation" P.6-9 of Baifukan Co., Ltd. Issue as an example using gel in this case on September 10, 1983.
[0004]
[Problem(s) to be Solved by the Invention] The time and effort of logging when taking out the specific portion in which fractionation was carried out by electrophoresis with the above-mentioned conventional technology required the help, and was not easy. Furthermore, conventionally, the extraction of a molecule which only imprints the aforementioned electrophoresis pattern to a photographic plate etc., and is distributed over each position was difficult, and especially the determination of the base sequence of DNA was not easy extraction.
[0005] Then,'this invention proposes the new electrophoresis apparatus from which the aforementioned fault was removed.
[0006]
[Means for Solving the Problem] this invention is the composition of which logging of the specific section of an electrophoresis pattern made possible with the sampler which has the movable table equipped with the ultraviolet line light source, the photomultiplier tube, and the sampler for gel logging, displays on the screen of the display combined with the computer while inputting the aforementioned electrophoresis pattern into a computer during electrophoresis or after electrophoresis according to a scan according the molecule which gave the fluorescence indicator to the aforementioned ultraviolet line light source within an electrophoresis tub, and is further controlled by the computer.

[0007]
[Function] Since according to the electrophoresis apparatus of this invention electronic processing is attained by computer and it can display on the monitor combined with the computer based on it after obtaining from the molecule started with the sampler and obtaining the electrophoresis pattern of the molecule subdivided further as extraction data, while the time and effort by the conventional gel logging is reducible, data accumulation becomes easy and the determination of the base sequence of DNA etc. can carry out quickly further.
[0008]
[Example] When this invention is explained according to a drawing, the block diagram in which drawing 1 shows the composition of the electrophoresis apparatus of this invention, the state diagram in which drawing 2 shows an electrophoresis pattern and a specific molecule extraction block, and drawing 3 are the perspective diagrams showing the extraction capsule for molecule extraction. In drawing 1 , 1 is the computer which generates various kinds of data processing and driving signals, and the monitor 2 as display is combined.
[0009] X table on which, as for 3, an interface (I/F) is performed by the direction driving source 7 of X, the direction driving source 8 of Y, and the Z direction driving source 9, and, as for 4, 5, and 6, movement is respectively performed to the direction of X, the direction of Y, and a Z direction, Y table, and Z table are shown. 10 is a sampler 11, the photomultiplier tube 12, and the head that changes lens 13, and UV line is supplied from the UV light source (ultraviolet line light source) 14 through the optical fiber 15 as a photoconductivity means to the aforementioned lens 13. The aforementioned head 10 is the axis of rotation 16, and it is rotated so that it may be set as a position on the X table 4.
[0010] 17 the power supply for the photomultiplier tubes, and 19 for a sampler driving gear and 18 An agarose-gel-electrophoresis tub, An acrylamide gel electrophoresis tub is shown, UV line supplied through the optical fiber 15 irradiates each electrophoresis tub 19 or 20 through a lens 13, and 20 extracts an electrophoresis pattern with the photomultiplier tube 12. By amplifier 21, signal amplification is performed, analog-to-digital (A/D) conversion of the output is carried out by A/D converter 22, and the digital signal obtained as an output joins a computer 1 through an interface (I/F) 3, and is displayed on the screen of the monitor 2 after data processing.
[0011] Next, supply of the power supply for electrophoresis first laid on the Y table 5 when detailed operation of this equipment was explained carries out fractionation of each molecule like drawing 2 soon according to electrophoresis speed.
[0012] Since the fluorescence indicator of each molecule has been carried out beforehand, if an ultraviolet-rays (UV) spot is irradiated and gel is scanned, existence of a molecule will be detected as strength of a visible field. The photomultiplier tube 12 is built in the head 10 in drawing 1 as optical system containing the ultraviolet rays as the point light source from an optical fiber 15, and the lens 13 which irradiates it at gel, and the fluorescence of the spot in gel is detected.
[0013] This head 10 is installed in the X table 4, by driving this X table 4 by the direction driving source 7 of X, the scan of X shaft orientations is made and the strength image of fluorescence is obtained.
[0014] The Y table 5 is set as a proper position by the direction driving source 8 of Y, and an automatic migration halt is also possible for it in extracting a passage pattern. Furthermore, a desired molecule can be extracted by adding the mechanism of the sampler gone up and down with the sampler driving gear 17 to the head 10, for example, inserting an extraction capsule like drawing 3 in a desired position, and performing electrophoresis.
[0015] In addition, as correspondence to the electrophoresis of the vertical mold using acrylamide gel, a head 10 is the composition rotated focusing on the axis of rotation 16 in drawing 1 , if the Z table 6 is formed in order that it may perform movement to a Z direction if needed as drawing 1 , it will become movable to each direction of X, Y, and Z, and it will become easy to extract [of an electrophoresis pattern] it.
[0016] Each table (X, Y, and Z), the sampler driving gear 17, the UV light source 14, and each driving sources 7, 8, and 9 are controlled by the computer 1 formed as a control unit through an interface (I/F) 3.

[0017] Moreover, the signal acquired with the photomultiplier tube 12 as mentioned above is the amplifier tube 21 (for example, operational amplifier) etc., and it is amplified, it is A/D converter 22, and is inputted into a computer 1 through an interface (I/F) 3 after an analog / digital conversion, and data processing is carried out to patternizing, component-izing, presumption of molecular weight, etc., and it is displayed on the screen of the monitor 2 for a display.
[0018]
[Effect of the Invention] The head equipped with the ultraviolet line light source, an electron multiplier, optical system, and the sampler scans on electrophoresis gel, pattern extraction carries out, logging of a desired gel portion can perform, an advantage -- especially the base sequence of DNA can be determined quickly -- is acquired as an electrophoresis apparatus based on the data, and, according to the electrophoresis apparatus of this invention, the effect is size very much, without imprinting protein or the electrophoresis pattern in the fractionation of a DNA fragment to a photographic plate etc. like before.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Industrial Application] While scanning and detecting this invention on electrophoresis gel by the head using the ultraviolet line light source, an electron multiplier, optical system, and the sampler for a sampling, inputting the detection data into a computer and making logging of a desired gel portion possible with the aforementioned sampler based on it with respect to the electrophoresis apparatus used for fractionation, such as protein or a DNA (abbreviated name of Desoxyribonucleic Acid DESOKISHIRIBO nucleic acid) fragment, especially. It is related with this equipment which carries out a pattern display to the display combined with the computer.

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PRIOR ART

[Description of the Prior Art] When carrying out fractionation to the fractionation of protein or a DNA fragment using electrophoresis generally, taking out a specific portion, performing various processings (PCR:polymerase chain reaction etc.) for it and performing electrophoresis further, a help starts logging of the aforementioned particular part first, and the time and effort is not easy, either. Furthermore, while the aforementioned electrophoresis pattern was imprinted to the photographic plate etc. and the expert read, it was analyzing.

[0003] Then, the electrophoresis apparatus with a water tank is shown in 1983 year 11 month 20 day Kodansha Issue "molecular biology experiment Manual" P.99-102, and the example of agarose gel is further shown in "principle of gene manipulation" P.6-9 of Baifukan Co., Ltd. Issue as an example using gel in this case on September 10, 1983.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] the electrophoresis pattern [according to the electrophoresis apparatus of this invention] in the fractionation of protein or a DNA fragment -- the former -- like . Without imprinting to a photographic plate etc., the head equipped with the ultraviolet line light source, an electron multiplier, optical system, and the sampler is scanned on electrophoresis gel, pattern extraction is carried out, based on the data, logging of a desired gel portion can be performed, an advantage -- especially the base sequence of DNA can be determined quickly -- is acquired as an electrophoresis apparatus, and the effect is size very much.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The time and effort of logging when taking out the specific portion in which fractionation was carried out by electrophoresis with the above-mentioned conventional technology required the help, and was not easy. Furthermore, conventionally, the extraction of a molecule which only imprints the aforementioned electrophoresis pattern to a photographic plate etc., and is distributed over each position was difficult, and especially the determination of the base sequence of DNA was not easy extraction.

[0005] Then, this invention proposes the new electrophoresis apparatus from which the aforementioned fault was removed.

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MEANS

[Means for Solving the Problem] this invention is the composition of which logging of the specific section of an electrophoresis pattern made possible with the sampler which has the movable table equipped with the ultraviolet line light source, the photomultiplier tube, and the sampler for gel logging, displays on the screen of the display combined with the computer while inputting the aforementioned electrophoresis pattern into a computer during electrophoresis or after electrophoresis according to a scan according the molecule which gave the fluorescence indicator to the aforementioned ultraviolet line light source within an electrophoresis tub, and is further controlled by the computer.

[Translation done.]

* NOTICES *

OPERATION

[Function] Since according to the electrophoresis apparatus of this invention electronic processing is attained by computer and it can display on the monitor combined with the computer based on it after obtaining from the molecule started with the sampler and obtaining the electrophoresis pattern of the molecule subdivided further as extraction data, while the time and effort by the conventional gel logging is reducible, data accumulation becomes easy and the determination of the base sequence of DNA etc. can carry out quickly further.

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EXAMPLE

[Example] When this invention is explained according to a drawing, the block diagram in which drawing 1 shows the composition of the electrophoresis apparatus of this invention, the state diagram in which drawing 2 shows an electrophoresis pattern and a specific molecule extraction block, and drawing 3 are the perspective diagrams showing the extraction capsule for molecule extraction. In drawing 1 , 1 is the computer which generates various kinds of data processing and driving signals, and the monitor 2 as display is combined.
[0009] X table on which, as for 3, an interface (I/F) is performed by the direction driving source 7 of X, the direction driving source 8 of Y, and the Z direction driving source 9, and, as for 4, 5, and 6, movement is respectively performed to the direction of X, the direction of Y, and a Z direction, Y table, and Z table are shown. 10 is a sampler 11, the photomultiplier tube 12, and the head that changes lens 13, and UV line is supplied from the UV light source (ultraviolet line light source) 14 through the optical fiber 15 as a photoconductivity means to the aforementioned lens 13. The aforementioned head 10 is the axis of rotation 16, and it is rotated so that it may be set as a position on the X table 4.
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[0011] Next, supply of the power supply for electrophoresis first laid on the Y table 5 when detailed operation of this equipment was explained carries out fractionation of each molecule like drawing 2 soon according to electrophoresis speed.
[0012] Since the fluorescence indicator of each molecule has been carried out beforehand, if an ultraviolet-rays (UV) spot is irradiated and gel is scanned, existence of a molecule will be detected as strength of a visible field. The photomultiplier tube 12 is built in the head 10 in drawing 1 as optical system containing the ultraviolet rays as the point light source from an optical fiber 15, and the lens 13 which irradiates it at gel, and the fluorescence of the spot in gel is detected.
[0013] This head 10 is installed in the X table 4, by driving this X table 4 by the direction driving source 7 of X, the scan of X shaft orientations is made and the strength image of fluorescence is obtained.
[0014] The Y table 5 is set as a proper position by the direction driving source 8 of Y, and an automatic migration halt is also possible for it in extracting a passage pattern. Furthermore, a desired molecule can be extracted by adding the mechanism of the sampler gone up and down with the sampler driving gear 17 to the head 10, for example, inserting an extraction capsule like drawing 3 in a desired position, and performing electrophoresis.
[0015] In addition, as correspondence to the electrophoresis of the vertical mold using acrylamide gel, a head 10 is the composition rotated focusing on the axis of rotation 16 in drawing 1 , if the Z table 6 is

formed in order that it may perform movement to a Z direction if needed as drawing 1 , it will become movable to each direction of X, Y, and Z, and it will become easy to extract [of an electrophoresis pattern] it.
[0016] Each table (X, Y, and Z), the sampler driving gear 17, the UV light source 14, and each driving sources 7, 8, and 9 are controlled by the computer 1 formed as a control unit through an interface (I/F) 3.

[0017] Moreover, the signal acquired with the photomultiplier tube 12 as mentioned above is the amplifier tube 21 (for example, operational amplifier) etc., and it is amplified, it is A/D converter 22, and is inputted into a computer 1 through an interface (I/F) 3 after an analog / digital conversion, and data processing is carried out to patternizing, component-izing, presumption of molecular weight, etc., and it is displayed on the screen of the monitor 2 for a display.

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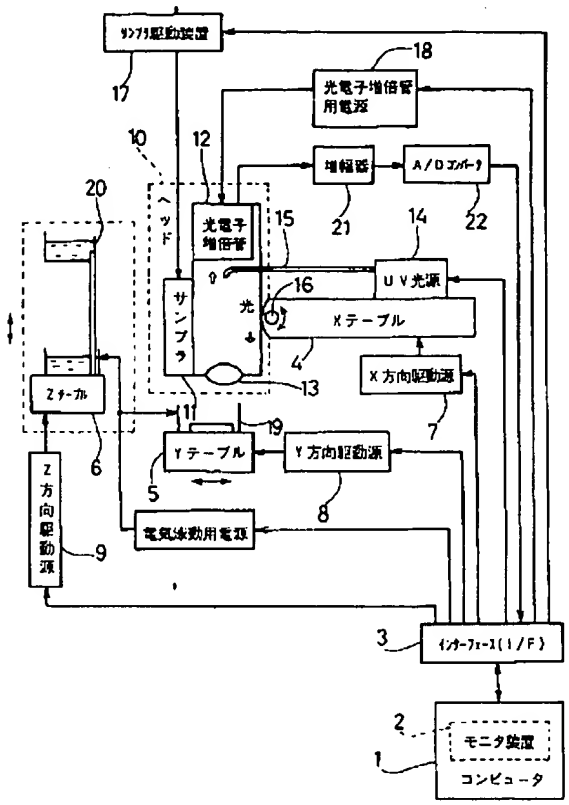
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the block diagram showing the electrophoresis apparatus of this invention.
[Drawing 2] Drawing 2 is an electrophoresis pattern in this equipment, and the state diagram of a specific molecule extraction block.
[Drawing 3] Drawing 3 is the perspective diagram of the extraction capsule for molecule extraction in this equipment.
[Description of Notations]
1 Computer
2 Monitor
3 Interface
4 X Table
5 Y Table
6 Z Table
10 Head
11 Sampler
12 Photomultiplier Tube
13 Lens
19 20 Electrophoresis tub
22 A/D Converter

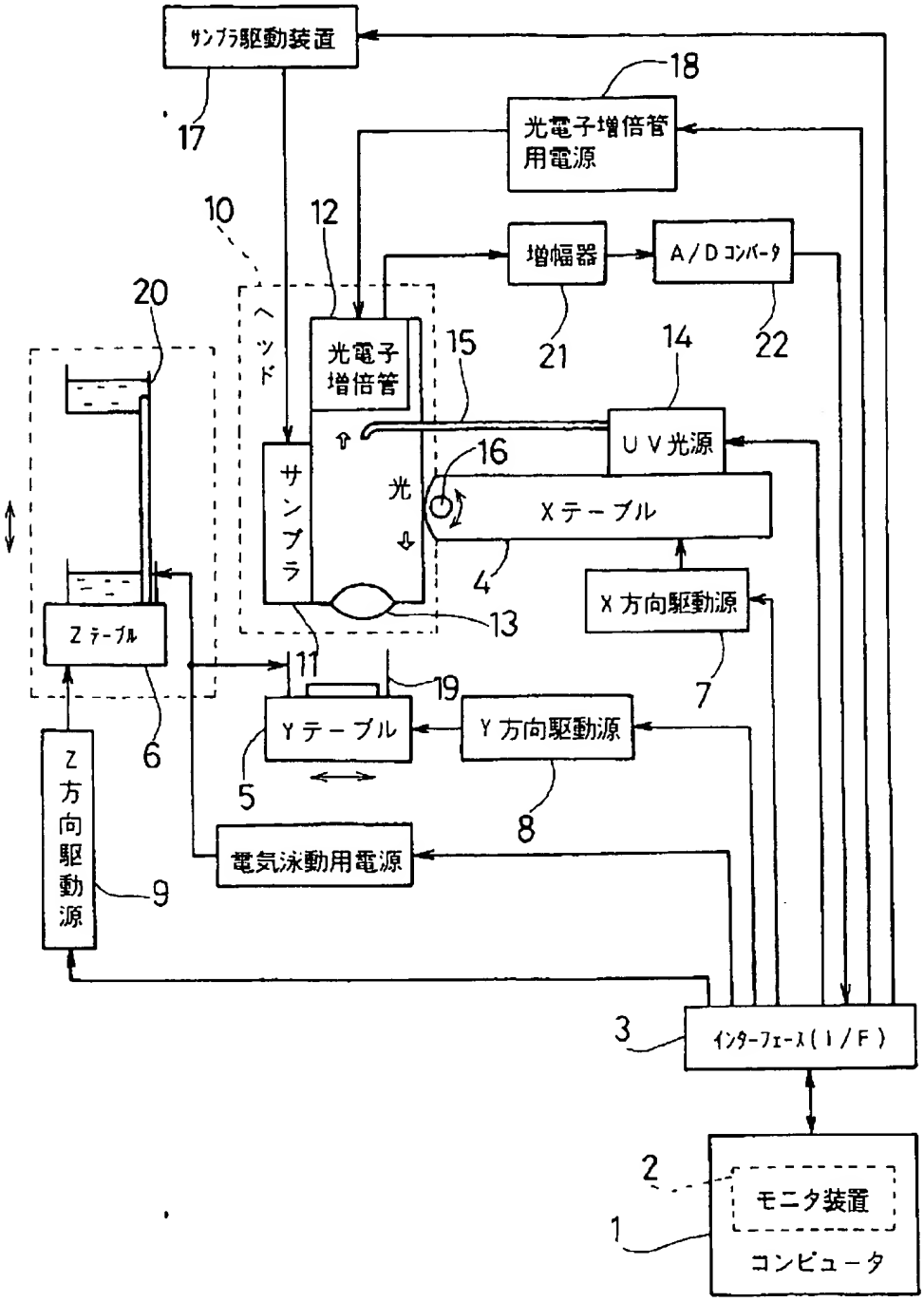
[Translation done.]

Drawing selection [Representative drawing]



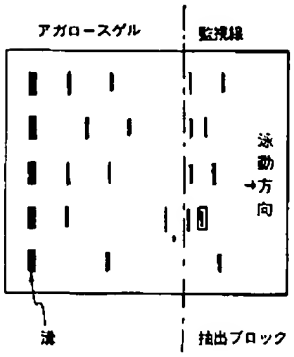
[Translation done.]

Drawing selection drawing 1



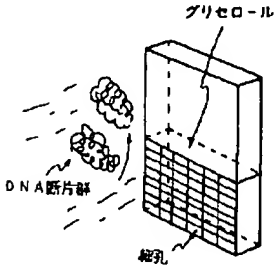
[Translation done.]

Drawing selection drawing 2



[Translation done.]

Drawing selection drawing 3



[Translation done.]